**SUPPORTING INFORMATION FOR**

The leaching characteristics of common toxic elements in phosphogypsum

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Fig. S1 Major chemical composition of the phosphogypsum used in this study and from other sources.



Fig. S2 Content of metals and As in phosphogypsum.

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Table S1 Pairwise Wilcoxon test results of the differences in the responses of leachate pH and Ec and soluble P, fluoride, Zn, Pb, As, and Hg extraction concentrations to the effect of the liquid/solid ratio, temperature, oscillation strength, particle size and pH.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Batch test | subgroup | pH | Ec | Soluble P | Fluoride | Zn | Pb | As | Hg |
| p | p | p | p | p | p | p | p |
| L/S ratio | 5:1 vs 10:1 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＞0.05 | ＜0.05 | ＜0.05 |
| 5:1 vs 20:1 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 |
| 10:1 vs 20:1 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 |
| Temperature | 25°C vs 35°C | ＞0.05 | ＞0.05 | ＞0.05 | ＞0.05 | ＞0.05 | ＞0.05 | ＞0.05 | ＞0.05 |
| 35°C vs 45°C | ＞0.05 | ＜0.05 | ＜0.05 | ＞0.05 | ＜0.05 | ＜0.05 | ＞0.05 | ＞0.05 |
| 25°C vs 45°C | ＞0.05 | ＞0.05 | ＜0.05 | ＞0.05 | ＞0.05 | ＜0.05 | ＞0.05 | ＞0.05 |
| oscillating strength | 0 vs 30 rpm | ＞0.05 | ＞0.05 | ＜0.05 | ＜0.05 | ＞0.05 | ＞0.05 | ＞0.05 | ＞0.05 |
| 30 vs 60 rpm | ＞0.05 | ＞0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＞0.05 | ＞0.05 | ＜0.05 |
| 0 vs 60 rpm | ＞0.05 | ＞0.05 | ＜0.05 | ＜0.05 | ＞0.05 | ＞0.05 | ＜0.05 | ＞0.05 |
| partical size | A vs B | ＞0.05 | ＞0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 |
| B vs C | ＞0.05 | ＞0.05 | ＞0.05 | ＞0.05 | ＜0.05 | ＞0.05 | ＜0.05 | ＜0.05 |
| A vs C | ＞0.05 | ＞0.05 | ＞0.05 | ＞0.05 | ＞0.05 | ＞0.05 | ＜0.05 | ＜0.05 |
| pH test | 2.20 vs 5.00 | ＜0.05 | ＜0.05 | ＜0.05 | ＞0.05 | ＞0.05 | ＜0.05 | ＜0.05 | ＜0.05 |
| 5.00 vs 10.00 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＞0.05 | ＜0.05 | ＜0.05 |
| 2.20 vs 10.00 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 | ＜0.05 |

A, B, and C denote 10-50 mesh, 50-100 mesh, ＜100 mesh, respectively. Ec denotes electrical conductance.